

Aaron J. Slowey

aslowey@usgs.gov, (650) 329-5474, 345 Middlefield Road, Mail Stop 466, Menlo Park,
California 94025; profile.usgs.gov/aslowey

EDUCATION

Stanford University, Stanford, California

Ph.D., Environmental Geochemistry, 2006

Dissertation: Speciation and transport of mercury from mine tailings to model sulfidogenic sediments.

University of California, Berkeley

M.Sc., Civil and Environmental Engineering, 2001

Northeastern University, Boston, Massachusetts

B.S. summa cum laude with honors, Civil Engineering, 2000

EXPERIENCE

Research Chemist

U.S. Geological Survey, Menlo Park, California, 2009-present

Collaborators: George Aiken and Mark Marvin-DiPasquale

Dissolved metal speciation and the rate and extent of metal (Cu, Pb, and Zn) sulfide formation in the presence of natural organic matter and their molecular-to-nanometer-scale structure; *in situ* voltammetric quantification of metal species and redox master variables; synchrotron X-ray scattering and X-ray absorption spectroscopy (XAS); dynamic light scattering (DLS).

Mendenhall Postdoctoral Fellow

U.S. Geological Survey, Menlo Park, California, 2007-2009

Studied the formation of mercury sulfide nanoparticles in the presence of natural organic matter using a combination of ultracentrifugation and mercury cold vapor atomic fluorescence spectrometry, XAS, DLS, and voltammetry.

Consultant

Public Resource Associates, Reno, Nevada (client), 2006-2007

Conducted field measurements in a former mercury mining district, sampled water and sediment, analyzed samples in the laboratory, managed an analytical subcontract, and wrote an interpretive report on mercury transport and iron and sulfur geochemistry.

Contractor

U.S. Geological Survey, Menlo Park, California, 2006-2007

Sampled water, soil, and sediment at inoperative mercury and gold mine sites, performed chemical analyses and applied geochemical models, and wrote interpretive reports.

Research Assistant

Stanford University, Stanford California, 2001-2006

Advisor: Gordon E. Brown, Jr.

- Collected water and tailings at mine sites for laboratory experiments.
- Determined the speciation of mercury and arsenic in mine tailings and contaminated sediments using XAS.
- Studied colloidal transport mechanisms of arsenic and mercury from mine tailings with packed laboratory column leaching experiments.
- Performed uptake and molecular solid-phase structure measurements of mercury adsorbed to iron oxyhydroxide across a sulfide chemical gradient.

Engineer's assistant

Santa Clara Valley Water District, San Jose, California, 2001

Wrote briefs on interpretive reports; modeled subsurface hydraulic conductivity and perchlorate transport.

Consultant

Massachusetts Water Resources Authority, Boston, Massachusetts, 2000

Studied the effect of ozone on the kinetics of chloramine decay during drinking water disinfection.

Engineer's assistant

Montgomery Watson, Boston, Massachusetts, 1998-2000 (semi-quarterly internships)

Inspected design drawings, documents, and assisted with field reconnaissance during a combined sewer system rehabilitation project; operated an ozonation and filtration water treatment pilot plant and measured aqueous chlorine and ozone.

SKILLS

- Synchrotron-based X-ray absorption fine structure (XAFS) spectroscopy and small-angle X-ray scattering (SAXS)
- Voltammetry and electrode fabrication for *in situ* analysis of trace metal speciation and redox master variables
- Dynamic light scattering and zeta potential
- Transmission and scanning electron microscopy
- Mercury cold vapor atomic fluorescence spectrometry
- Conventional and synchrotron-based X-ray diffraction
- Selective solid-phase iron and sulfur extraction
- Ion chromatography
- Geochemical modeling

PUBLICATIONS

Refereed Journal Articles

Slowey, A. J., Johnson, S. B., Newville, M., Brown, G. E., Jr. Speciation and colloid transport of arsenic from mine tailings. *Applied Geochemistry*. **2007**, 22, 1884-1898.

Slowey, A. J., Brown, G. E., Jr. Transformations of mercury, iron, and sulfur during the reductive dissolution of iron oxyhydroxide by sulfide. *Geochimica et Cosmochimica Acta*. **2007**, 71, 877-894.

Slowey, A. J., Johnson, S. B., Rytuba, J. J., Brown, G. E., Jr. Role of organic acids in promoting colloidal transport of mercury from mine tailings. *Environmental Science and Technology*. **2005**, 39, 7869-7874.

Slowey, A. J., Rytuba, J. J., Brown, G. E., Jr. Speciation of mercury and mode of transport from placer gold mine tailings. *Environmental Science and Technology*. **2005**, 39, 1547-1554.

Johnson, S. B., Yoon, T. H., **Slowey, A. J.**, Brown, G. E., Jr. Adsorption of organic matter at mineral/water interfaces: 3. Implications of surface dissolution for adsorption of oxalate. *Langmuir* **2004**, 20, 11480-11492.

Manuscript in review

Slowey, A. J. Rate of formation and dissolution of mercury sulfide nanoparticles: The dual role of natural organic matter. Submitted to *Geochimica et Cosmochimica Acta* on December, 2009.

Technical reports

Slowey, A. J., Rytuba, J. J. Mercury Release from the Rathburn Mine, Petray Mine, and Bear Valley Saline Springs, Colusa County, California 2004–2006. *U.S. Geological Survey Open File Report* **2008**-1179. 54 pages.

Slowey, A. J., Rytuba, J. J., Hothem, R. L., May, J. T. Mercury at the Oat Hill Extension Mine and James Creek, Napa County, California: Tailings, Sediment, Water, and Biota, 2003–2004. *U.S. Geological Survey Open File Report* **2007**-1132. 60 pages.

PROPOSALS

Awarded (as P.I.)

Development of an electrochemical surrogate for copper, lead, and zinc bioaccessibility in aquatic sediments. *Strategic Environmental Research and Development Program (SERDP)*, U.S. Department of Defense (\$150k), 2009-present.

Development of an electrochemical surrogate for mercury bioaccessibility in aquatic soils and sediments. *U.S. Geological Survey Venture Capital Fund* (\$30k), 2009-present.

Pending

Development of an electrochemical surrogate for copper, lead, and zinc bioaccessibility in aquatic sediments. Submitted to U.S. Department of Energy April, 2009 (\$150k), as P.I.

Spatial variation in microbial processes controlling carbon mineralization within soils and sediments. *Submitted to U.S. Department of Energy November, 2009*, as a collaborator.

Qualifying

Spectroscopic characterization of copper, lead, and zinc-sulfide nanoparticles in conjunction with electrochemical speciation of aqueous copper, lead, and zinc in the presence of dissolved organic matter. *Stanford Synchrotron Radiation Lightsource*, in review.

Sulfide-driven nucleation, growth, and aggregation of mercury sulfide in the presence of natural organic matter. *Advanced Light Source, Lawrence Berkeley National Laboratory*, 2008-present.

Environmental chemistry of mercury in reducing sedimentary environments. *Stanford Synchrotron Radiation Laboratory*, 2004-2006.

AWARDS AND RECOGNITION

Mendenhall postdoctoral fellowship (U.S. Geological Survey), 2007-2009

U.S. Geological Survey Mineral Resources Program research grant (Stanford University), 2005-2006

Full out-of-state tuition scholarship (University of California Berkeley), 2001

Summa cum laude with honors (Northeastern University), 2000

SELECT PRESENTATIONS (Invited*)

*Slowey, A. J. and Gilbert, B. Kinetics of mercury-sulfide nanoparticle formation in the presence of dissolved organic matter. Oral presentation and poster V23D-2164, American Geophysical Union Fall Meeting **2008**, San Francisco, California.

Slowey, A. J. Metal-sulfide precipitation in the presence of natural organic matter: Reaction pathways, mechanisms, and development of analytical tools for dynamic systems. Seminar, Stanford University **2008**, Stanford, California.

*Slowey, A. J. Studies of how mercury can become potentially bioavailable: Influences of iron and sulfur geochemistry. *Sacramento State University Geology Department/U.S. Geological Survey Colloquium Series* **2008**, Sacramento, California.

Slowey, A. J., Gilbert, B., Aiken, G. R., Ryan, J. N. Sulfide-driven precipitation of mercury sulfide nanoparticles in the presence of natural organic matter. Oral presentation 119-12, *Joint meeting of the Geological Society of America et al.* **2008**, Houston, Texas.

Slowey, A. J., Brown, G. E., Jr. Transformations of mercury, iron, and sulfur during the reductive dissolution of iron oxyhydroxide by sulfide. Oral presentation 2857, *16th V. M. Goldschmidt Conference* **2006**, Melbourne, Australia.

Slowey, A.J., Brown, G.E., Jr. Spectroscopic investigations of mercury-contaminated sediments: Adapating restoration goals to mechanistic research. Division of Geochemistry presentation 82. *Research, Education and Outreach in the NSF Environmental Molecular Science Institutes*. 230th American Chemical Society National Meeting **2005**, Washington, D.C.

Slowey, A.J., Rytuba, J.J., Brown, G.E., Jr. Mercury speciation and transport from historic placer gold and mercury mines, California. Oral presentation, *Hydrobiogeochemical Cycle of Mercury*, Paper No. 46-2. 101st Annual Meeting, Geological Society of America December **2005**, San Jose, California.

Slowey, A. J., Brown, G. E., Jr. The reliability of Hg L_{III}-edge extended X-ray absorption fine structure in speciating mercury in mine tailings, soils, and sediments. Poster presentation, *31st Stanford Synchrotron Radiation Laboratory User Meeting* October **2004**, Menlo Park, California. Awarded Best Student Poster in environmental science.

Slowey, A. J., Johnson, S. B.; Rytuba, J. J., Brown, G. E., Jr. Transport of colloid-associated mercury: column experiments and microscopic, spectroscopic, and chemical analyses of colloidal material. Oral presentations at the *227th American Chemical Society National Meeting* **2004**, Anaheim, California and *American Geophysical Union 2003 Fall Meeting*, Biogeosciences session B11E-03: *Molecular Biogeochemical Processes of Terrestrial Environments II*. **2003**, San Francisco, California.

TEACHING EXPERIENCE

Teaching Assistant

Environmental Geochemistry, Stanford University, 2001-2002
Earth Materials, Stanford University, 2001-2002

Workshop Assistant

Stanford Environmental Molecular Science Institute, 2005 and 2009
Helped develop a curriculum to expose high school teachers to environmental science perspectives.

Student Advisor

Mentored M.Sc. candidate in the Department of Earth Systems at Stanford University on aquatic chemistry and technical writing, 2004-2005.

PROFESSIONAL ACTIVITIES

Member

Geochemical Society of America
American Geophysical Union
American Chemical Society

Reviewer

Environmental Science and Technology, 2006 to present
Geochimica et Cosmochimica Acta, 2008 to present
Stanford Synchrotron Radiation Laboratory user proposals, 2008 to present
National Science Foundation Geobiology and Low-Temperature Geochemistry Division, 2009 to present

REFERENCES

Professor Gordon E. Brown, Jr.

Ph.D. advisor

Department of Geological & Environmental Sciences, Stanford University

gordon.brown@stanford.edu; (650) 723-9168

Building 320, Stanford, California 94305

Dr. George Aiken

Current collaborator

U.S. Geological Survey

graiken@usgs.gov; (303) 541-3036

3215 Marine Street, Suite E-127, Boulder, Colorado 80303

Dr. Mark Marvin-DiPasquale

Current supervisor

Microbiologist, U.S. Geological Survey

mmarvin@usgs.gov; (650) 329-4442 or (650) 906-2640

345 Middlefield Road, Mail Stop 480, Menlo Park, California 94025

Dr. Benjamin Gilbert

Current collaborator

Earth Sciences Division, Lawrence Berkeley National Laboratory

bgilbert@lbl.gov; (510) 495-2748

1 Cyclotron Road, Mail Stop 90-1116, Berkeley, California 94720